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A Statistical Study to Determine the Factors of Vitamin D Deficiency in Men: the City of Baghdad as a Model

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Abstract

Background: Exposure to sun in the sunny days for 10 to 15 minutes a day and two to three times a week is enough to get vitamin D requirements in the majority, but people with darker skin need to be exposed to sun for longer periods to get their vitamin requirements. The purpose of this research was to achieve a statistical study to know and determine the factors behind deficiency of vitamin D among men in Baghdad city in addition to knowing the most important diseases associated with its deficiency in order to inform and educate the community as well as to raise awareness of the society about the role of this vital vitamin, prevention of its deficiency and to propose appropriate treatment for it. **Methods:** The research was conducted in several private clinics in Baghdad throughout 2017. The investigation was including study of 500 cases of men who were randomly selected. The cases were divided according to age groups into two groups: the first group was (20-40) years, while the other group was (more than 40 years). Also, the cases were classified according to vitamin D level to sufficient, insufficient and deficient. Results**:** The results obtained from the study showed that the percentage of vitamin D insufficient and deficient were 69.6% and 18.8%, respectively, while the sufficiency percentage was the lowest and scored 11.6%. Common chronic diseases, such as high blood pressure and diabetes as well as sleep disorders and muscle fatigue, were also followed in the cases. The results illustrated that 47.6% of men cases had diabetes and 39% had high blood pressure, while 28.2% and 17.2% of them had muscular fatigue and sleep disorders, respectively. These chronic diseases and symptoms were related in one way or another with Vitamin D deficiency. **Conclusion**: Vitamin D can be given for preventive and therapeutic purposes.

Keywords*: vitamin D, diabetes mellitus, sun exposure, calcitriol.*

Introduction

The mention of Vitamin D is directly related to sunlight, which is called the vitamin of sun rays, because this vitamin is made in sufficient quantities inside the body when exposed to the moderate sunlight with the association of cholesterol [(1)]. So, taking this vitamin is not considered a necessary food in the event of adequate exposure to sunlight. Exposure to sun in the sunny days for 10 to 15 minutes a day and two to three times a week is enough to get vitamin D requirements in the majority, but people with darker skin need to be exposed to sun for longer periods to get their vitamin requirements [(2)]. Despite the easy access to the body's needs of vitamin D through the sun, many people avoid sun exposure, or use sunscreen - which hinders the production of vitamin D in the skin - to protect the skin from damage caused by sun such as wrinkles and skin cancer [(3)]. For the benefit of exposure to sunlight and avoid damage at the same time, the best thing to do is to use the sunscreen after exposure for a long time enough to get requirements of vitamin D. the latter, although called vitamin, is actually not a vitamin but a hormone produced in the body as a result of exposure to sunlight [(4)]. The active form of this hormone

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is represented by 1, 25-dihydroxycholecalciferol, or 1alpha, 1, 25-dihydroxyvitamin D3 also called (Calcitriol). The manufacture of this hormone begins in the skin and then activated by two steps; the first in the liver and the second in the kidneys [5]. People living in the Arctic cannot get their vitamin D needs through exposure to sun, especially in the winter, as well as people who do not leave the home or whose live confined to indoor areas and buildings and people living in crowded places where air pollution is high, which prevents the arrival of ultraviolet light adequately [6]. Also dark-skinned people, as dense skin pigments can prevent up to 95% of ultraviolet rays from reaching deep layers of skin, the manufacture of vitamin D3. The use of sunscreen with a protective factor of 15 or more reduces skin's ability to manufacture vitamin D for up to 99% [3]. When talking about the importance of vitamin D and its functions in the body, the first thing that comes to mind is its importance in the absorption of calcium and phosphorus as well as bone health, but science is still discovering functions and other important roles of vitamin D [7]. Vitamin D functions include maintaining balance of calcium and phosphorus in the body by stimulating the absorption of calcium and phosphorus as well as reabsorption in kidneys [1,2]. It works with the hormone of parathyroid gland to promote release of calcium from bones. Also, it remove phosphorus through urine when the level of calcium in the blood is decraesed, which thus maintains the concentration of calcium and phosphorus in the blood to allow the bones to precipitate them [1], guaranteed getting adequate amounts of vitamin D and calcium to preserve the level of calcium in the blood, thus preserving bone health [3]. Moreover, it maintains normal growth, differentiation and proliferation rates of cells of many body tissues such as muscles, skin, immune system, parathyroid gland [1] as well as nervous system, brain, genital organs, cartilage pancreas, breast and colon [2]. Furthermore, it contributes to prevention of abnormal reproduction of cells in the prevention of cancer [3]. It contributes to the metabolism of muscles and affects their strength and constriction. In contrast, people who do not have sufficient vitamin D are at increased risk of muscle weakness, this includes weakness of the heart muscle [3]. Some studies had found that the level of vitamin D (calcitriol) in the blood is inversely proportional to insulin resistance and reduces the risk of type 2 diabetes mellitus [4]. Vitamin D contributes to the control of immune system responses that cause certain autoimmune disorders, such as type 1 diabetes mellitus, scleroderma, inflammatory bowel disease [3] and rheumatism caused by autoimmune defects [5]. One of the major diseases caused by vitamin D deficiency is rickets in children, osteoporosis and osteomalacia in adults, because its paucity leads to a decrease in the intake of calcium from food, and as a result, calcium is released from bones in order to maintain a constant rate of calcium in the blood. Vitamin D deficiency affects not only bones of children and adults but also affects teenagers, preventing them from reaching the largest bone mass they can reach [6]. In addition to the above, vitamin D deficiency has other effects such as increased chance of asthma as it was found to be associated with severe asthma in children [7,8]. Vitamin D deficiency causes increasing risk of bacterial and viral respiratory infections [8], the chance of depression [9], the chance of weight gain and obesity [10] as well as the chance of hypertension [11]. In addition, vitamin D deficiency increases the incidence of cognitive retardation in older persons [12] and increases the chance of death from any reason [11]. Vitamin D deficiency is considered as a major cause for increasing the risk of death from heart and vascular diseases. One of the major reasons for increasing cholesterol level in the body is deficiency of vitamin D [11] and its deficiency is related with cancer [13]. As well as all previously mentioned, deficiency of vitamin D leads to autoimmune diseases such as type 1 and 2 diabetes mellitus, multiple sclerosis and others.

The purpose of this research was to achieve a statistical study to know and determine the factors behind deficiency of vitamin D among men in Baghdad city in addition to knowing the most important diseases associated with its deficiency in order to inform and educate the community as well as to raise awareness of the society about the role of this vital vitamin, prevention of its deficiency and to propose appropriate treatment for it.

Methodology

Vitamin D, which is taken or synthesized in the skin, turns into a compound known as calcidiol, 25-hydroxycholecalciferol, or 25-hydroxyvitamin D (abbreviated 25(OH)D) [14]. Thus, the best test of body content of vitamin D is analysis of total level of 25-hydroxyvitamin D. There is a variance in the definition of vitamin D deficiency or inadequacy. In general, a person is severely deficient vitamin D (**Deficient**) if the result of 25-hydroxyvitamin D test

is less than 10ng/ml, while it is deficient (**Insufficient**) in the case of result between 10-29ng/ml. If the result is between 30-100ng/ml, it is normal and good (***Sufficient***), however, levels higher than 100ng/ml may cause toxicity (**Potential toxicity**) [15]. The present study was carried out in five private clinics in different regions of Baghdad in 2017 (from 1/1/2017 to 31/21/2017), which covered 500 cases of men and was laboratory monitored by a special questionnaire including checking date, the clinical condition and laboratory tests. The investigations of study comprised two parts; the first part was laboratory analysis and testing of vitamin D (which is 25-OH Vitamin D Total) and tests for chronic diseases (diabetes and high blood pressure), while the second part included followed up of accompanying symptoms of sleep disorders and muscle fatigue periodically for all men cases.

Statistical analysis

Statistical analysis of study results of was carried out by dividing data into the two groups; the first group was analyzed according to laboratory tests and the second group was according to age groups of participated men.

Results obtained according to laboratory tests

The study cases were divided according to results of laboratory tests of vitamin D-25 total deficiency into the following three groups; Group 1: Normal level of vitamin D (Sufficient) ranged between 30-100ng/ml, Group 2: Low level of Vitamin D (Insufficient) ranged between 10-30ng/ml and Group 3: Very low level of vitamin D (Deficient) with a value >10ng/ml. The number of cases who studied in these five private clinics was 500 persons who were monitored periodically via a special questionnaire for one year.

Table (1) Distribution of participants according to level of 25-OH Vitamin D Total

Vitamin D status	Reference Range	Number of Cases	Percentage
Sufficient	30-100	94	18.8
Insufficient	10-29	348	69.6
Deficient	> 10	58	11.6

From Table (1) was clear that the proportion of men with normal (**Sufficient**) level of vitamin D was the lowest, while the percentage of men with vitamin D deficiency was high and the highest proportion of participated men was with insufficient vitamin D.

Table (2) Distribution of vitamin D levels according to age groups of participating men

Age group/yr	Number of cases	Percentage	Vitamin D Level			Total
			Sufficient	Insufficient	Deficient	
20-40	323	64.6	65	212	46	323
>40	177	35.4	29	136	12	177
Total	500	100	94	348	58	500

Table (2) showed that the percentage of men who were deficient of vitamin D was the lowest one in both age groups followed by the percentage of men with sufficient vitamin D level with a clear increase in number of men with low level of vitamin D (Insufficient).

Two types of chronic diseases (diabetes mellitus and hypertension) are associated with vitamin D deficiency and were studied in current study. Also, follow-up of some of the accompanying symptoms, such as sleep disturbance and muscle fatigue, were studied, noting that it was probable that patients were suffering from more than one disease at the same time (Table 3).

Table (3) Relation of Vitamin D Deficiency with Other pathological conditions

Pathological condition	Number of Cases	Percentage	Vitamin D Level		
			Sufficient	Insufficient	Deficient
Diabetes mellitus	238	47.6	74	123	41
Hypertension	195	39.0	62	94	39
Sleep Disturbances	141	28.2	23	76	43
Muscle Fatigue	86	17.2	19	57	10

Table (3) showed that the number of men with diabetes mellitus and **insufficient** level of vitamin D was the highest among all associated diseases followed by those with hypertension, sleep disturbances and muscle fatigue, respectively. On the other hand, a high number of men with diabetes, high blood pressure and sleep disorders had vitamin D deficiency, both insufficient and deficient, indicating a close correlation between these diseases and vitamin D deficiency.

Vitamin D deficiency by months of the year

As previously illustrated, this research was conducted over a period of one year and follow-up of the cases during that period. All laboratory tests for vitamin D deficiency were performed for all the cases throughout the year (Table 4).

Table (4) Distribution of Vitamin D levels during months of the year

Vitamin D Level	Months of the year												Total
	1	2	3	4	5	6	7	8	9	10	11	12	
Sufficient	12	9	10	5	10	15	11	15	16	10	3	5	121
Insufficient	43	32	22	24	19	25	13	28	20	23	18	31	298
Deficient	5	7	9	3	8	6	8	9	4	8	1	9	77
Total number of cases	60	48	41	36	37	46	32	52	40	41	22	45	500
Percentage of (Insufficient + Deficient) Vitamin D	80	81.25	75.61	75	72.92	67.39	62.62	59.62	60	75.61	86.36	88.89	75

Table (4) showed that the percentage deficiency (both Insufficient and Deficient levels) of vitamin D was very high in comparison with the normal cases along the year. In winter and spring months (i.e. from October to March) there was significant increase in vitamin D deficiency, both Insufficient and Deficient levels, while in the summer months, these level was lower. This is certainly due to the fact that the sun light in the summer months is stronger and available more than in the winter months, so the body can get its requirement from Vitamin D easily.

Conclusions

Deficiency of vitamin D is considered as an important factor in the development of a large number of diseases and possibly all diseases, which can be called "the disease of all diseases". The following conclusions can be drawn from current study:

- A high percentage of patients are suffering from vitamin D deficiency making it a pandemic and is considered to be related to quality and quality of life.

- It is needed for wide and comprehensive surveys of vitamin D deficiency in children, women and men and all ages.

- It has become clear that vitamin D deficiency is indicated in front of any clinical exhibitor or a satisfactory condition.

- Vitamin D can be given for preventive and therapeutic purposes.

- Increase awareness of the benefits of exposure to sunlight, which represents a large energy away from all diseases.

- This study is considered as a first step in a series of steps to be taken in order to identify more comprehensively vitamin D deficiency among different population groups.

Recommendations

- Provision of free vitamin D in health centers for all who suffer from a shortage.

- Focusing on the scientific side by giving awareness lectures and seminars for medical staff and patients in health centers and hospitals similar to lectures and seminars on vaccines.

- All practitioners should consider vitamin D deficiency as one of the causes of chronic diseases and other clinical symptoms and perform a vitamin D deficiency analysis for patients in parallel to any other type of analysis.

- Exposure to sunlight directly for a period of 10-20 minutes 3 times a week and when sun is vertical (10-12 am), this is easy and available to sunny countries most of the year, like Iraq.

- Focus on eating foods rich in vitamin D such as fish (rosacea and tuna), egg yolks, liver, orange juice, legumes and mushrooms.

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